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10/769,777	02/03/2004	Jun-ho Sung	101-1015	9278

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EXAMINER
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ART UNIT	PAPER NUMBER
2609	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/18/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

	Application No.	Applicant(s)
Office Action Summary	10/769,777	SUNG ET AL.
	Examiner	Art Unit	
	Katrina Fujita	2609	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS,
WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☐ Responsive to communication(s) filed on _____.

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) _1-51_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) _1-51_ is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☒ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on _03 February 2004_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All   b)☐ Some * c)☐ None of:

      1. ☒ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____.

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _02/10/2004_.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Priority

1.   Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which

papers have been placed of record in the file.

Specification

2.   The disclosure is objected to because of the following informalities:

In paragraph 0042, line 1, "201" should be --S201--.

Appropriate correction is required.

Claim Suggestions

3.   In claim 8, line 3, "a threshold value for determining whether to split the sub

block" should be changed to -- a the threshold value for determining whether to split the

sub macro block--.

Claim Objections

4.   The following is a quotation of 37 CFR 1.75(a):

> The specification must conclude with a claim particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention or discovery.

5.   Claim 8 is objected to under 37 CFR 1.75(a), as failing to particularly point out and distinctly claim the subject matter which application regards as his invention or discovery.

Claim 8 lacks antecedent basis for "the operation of determining whether to split the sub block" in line 1. The following will be assumed for examination purposes: --the operation of determining whether to split the ~~sub~~ macro block--. This also will apply to lines 5, 6 and 8.

Claim 8 lacks antecedent basis for "determining the possibility of splitting the sub block" in line 2. The following will be assumed for examination purposes: --determining the possibility of splitting the ~~sub~~ macro block--.

Claim 8 lacks antecedent basis for "the ratio of maximum MAD to minimum MAD of the smaller sub block" in line 7. The following will be assumed for examination purposes: --the ratio of maximum MAD to minimum MAD of the ~~smaller sub~~ macro block--.

Claim Rejections - 35 USC § 102

6.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7.   Claims 1, 10, 13, 25, 27, 36, 39 and 51 are rejected under 35 U.S.C. 102(b) as

being anticipated by Mancini et al. ("Robust quadtree-based disparity estimation...",

SPIE article).

Regarding **claims 1, 10, 25, 27, and 36**, Mancini et al. discloses an apparatus

(an apparatus is inherent to carry out the function of the method) and a recording

medium on which a method is written as a program code that can be read and executed

on a computer (it is inherent that the method is written on a recording medium to enable

the method to performed), the program coded method of splitting an image block

("identify problematic blocks...and then split them" at section 6.5, paragraph 2, line 1)

comprising:

setting a plurality of splitting threshold values ("The steps above rely on three

threshold values" at section 6.5.1, paragraph 3, line 10) for a macro block ("block B_{ij}" at

section 6.5.1, paragraph 3, line 4) in an image frame and determining whether to split

the macro block into sub blocks ("determine whether block B_{ij} requires splitting" at

section 6.5.1, paragraph 3, line 6); and

setting a plurality of splitting threshold values ("The steps above rely on three threshold values" at section 6.5.1, paragraph 3, line 10) for each sub block and determining whether to split each sub block into smaller sub blocks ("Sub-blocks that will still fall on object boundaries can undergo further splitting" at section 6.5, paragraph 2, line 5)

wherein the image frame is a binocular image frame ("intermediate image I_I (Fig. 1) from the left-right image pair" at section 2, paragraph 2, line 4) representing a three dimensional image ("the '3D-ness' of the data" at section 1, paragraph 1, line 9).

Regarding **claims 13, 39 and 51**, Mancini et al. discloses an apparatus (an apparatus is inherent to carry out the function of the method) and method of splitting a block comprising:

splitting macro image blocks ("determine whether block B_{ij} requires splitting" at section 6.5.1, paragraph 3, line 6) each of left-eye views and right eye views ("stereoscopic test images" at section 6.5, paragraph 1, line 2) into sub image blocks ("split them into four equal-sied sub-blocks" at section 6.5, paragraph 2, line 1) according to quadtree disparity estimation ("Quadtree disparity estimation" at section 6 .5) and splitting each sub block into smaller sub blocks ("Sub-blocks that will still fall on object boundaries can undergo further splitting" at section 6.5, paragraph 2, line 5).

Claim Rejections - 35 USC § 103

8.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

9.   Claims 2, 3, 11, 12, 14-16, 19, 22, 26, 28, 29, 38, 40-42, 45, and 48 are rejected

under 35 U.S.C. 103(a) as being unpatentable over the combination of Mancini et al.

and Keith et al. (US 4,785,349).

Regarding **claims 2, 3, 16, 26, 28, 29 and 42**, Mancini et al. discloses an

apparatus (an apparatus is inherent to carry out the function of the method) and a

recording medium on which a method is written as a program code that can be read and

executed on a computer (it is inherent that the method is written on a recording medium

to enable the method to performed), the program coded method of splitting an image

block, comprising:

setting a plurality of macro block splitting threshold values for splitting a macro

block in an image frame into sub blocks and determining whether to split the macro

block; and

setting a plurality of sub block splitting threshold values for splitting the sub block

into smaller sub blocks and determining whether to split the sub block into smaller sub

blocks.

Mancini et al. does not teach that the step of determining whether to split the macro block is done according to whether a preceding macro block at the same location in a preceding image frame as the current macro block has been split and the step of determining whether to split the sub block is done according to whether a preceding sub block at the same location in a preceding macro block as the current sub block has been split.

Keith et al. discloses a system wherein the step of determining whether to split the macro block ("entire image area is selected as the target region. If this region cannot be adequately encoded, it is split into sub-regions" at col. 26, line 51) is done according to whether a preceding macro block at the same location in a preceding image frame as the current macro block ("region of a previous frame may be found that corresponds fairly well to a region being coded in a current frame" at col. 25, line 55) has been split ("If the comparison indicates that this best choice for a translated region does not provide an acceptable match to the target region, the target region is checked for minimum size (3924). If the target region is larger than the minimum size, it is split" at col. 27, line 16) and the step of determining whether to split the sub block ("sub-regions which are subsequently examined for encoding" at col. 26, line 53) is done according to whether a preceding sub block at the same location in a preceding macro block as the current sub block ("region of a previous frame may be found that corresponds fairly well to a region being coded in a current frame" at col. 25, line 55) has been split ("If the comparison indicates that this best choice for a translated region does not provide an acceptable match to the target region, the target region is checked

for minimum size (3924). If the target region is larger than the minimum size, it is split"
at col. 27, line 16).

It would have been obvious at the time the invention was made to one of ordinary
skill in the art for the split condition of Mancini et al. to be determined using the inter-
frame coding taught by Keith et al. as described above, for "one need only code the
differences rather than the absolute values" (Keith et al. at column 25, line 57).

Regarding **claims 11, 12, 19, 37, 38, and 45**, Mancini et al. discloses an
apparatus (an apparatus is inherent to carry out the function of the method) and a
method wherein the image frame is a binocular image frame representing a three
dimensional image as described in the 102 rejection of claim 10 above.

Regarding **claims 14, 15, 22 40, 41 and 48**, Mancini et al. discloses an
apparatus (an apparatus is inherent to carry out the function of the method) and a
method wherein the operation of splitting is performed using quadtree disparity
estimation as described in the 102 rejection of claim 13 above.

10.   Claims 4, 6, 30 and 32 are rejected under 35 U.S.C. 103(a) as being
unpatentable over the combination of Mancini et al. and Boyce (US 5,208,673).

Mancini et al. discloses an apparatus (an apparatus is inherent to carry out the
function of the method) and a method of splitting a block wherein the operation of
setting a plurality of splitting threshold values for a macro block in an image frame and
determining whether to split the macro block into sub blocks and wherein the operation

of setting a plurality of splitting threshold values for each sub block and determining

whether to split each sub block into smaller sub blocks comprises:

determining the possibility of splitting the macro block ("determine whether block

B_{ij} requires splitting" at section 6.5.1, paragraph 3, line 6) by determining whether the

ratio of maximum mean absolute difference (MAD) to minimum MAD of a sub block

("max(κ_i, i = 1,...,4)/min(κ_i, I = 1,...,4) < θ_3" at section 6.5.1, paragraph 3, line 9; "ratio of

the maximum to the minimum number of outliers in the four sub-blocks" at section 6.5.1,

paragraph 3, line 13) in the macro block is greater than a threshold value ("threshold

value θ_3" at section 6.5.1, paragraph 3, line 12) for determining the possibility of splitting

the macro block; and

determining whether to split the macro block by comparing the threshold value

for determining the possibility of splitting the macro block ("Threshold θ_2" at section

6.5.1, paragraph 3, line 11), and comparing the ratio of maximum MAD to minimum

MAD, and a threshold value for determining whether to split the macro block with one

another ("max(κ_i, i = 1,...,4)/min(κ_i, I = 1,...,4) < θ_3" at section 6.5.1, paragraph 3, line 9;

"ratio of the maximum to the minimum number of outliers in the four sub-blocks" at

section 6.5.1, paragraph 3, line 13), if a ratio is greater than the threshold for

determining the possibility of splitting the macro block ("if Σ κ_i < θ_2 then do not split,

otherwise continue" at section 6.5.1, paragraph 3, line 8; "tolerable number of outliers as

a fraction of the block size" at section 6.5.1, paragraph 3, line 11) and determining

whether to split the macro block into the sub blocks,

determining the possibility of splitting the sub block by determining whether the

ratio of maximum MAD to minimum MAD of the smaller sub block is greater than a

threshold value for determining the possibility of splitting the sub block; and determining

whether to split the sub block by comparing the threshold value for determining the

possibility of splitting the sub block, the ratio of maximum MAD to minimum MAD, and a

threshold value for determining whether to split the sub block with one another, if the

ratio of maximum MAD to minimum MAD is greater than the threshold value for

determining the possibility of splitting the sub block in the operation of determining the

possibility of splitting the sub block by determining whether the ratio of maximum MAD

to minimum MAD of the smaller sub block is greater than a threshold value for

determining the possibility of splitting the sub block (covered by method above).

Mancini et al. does not teach comparing the threshold value for determining the

possibility of splitting the macro block with the ratio of maximum MAD to minimum MAD,

comparing the threshold value for determining the possibility of splitting the sub block

with the ratio of maximum MAD to minimum MAD, and that the ratio greater than the

threshold for determining the possibility of splitting the macro block is the ratio of

maximum MAD to minimum MAD, and that the ratio greater than the threshold for

determining the possibility of splitting the sub block is the ratio of maximum MAD to

minimum MAD.

Boyce discloses a method comprising

comparing the threshold value for determining the possibility of splitting the

macro block ("determined value B" at col. 4, line 44) with the ratio ("ratio of MAD$_o$

/MAD_{min}" at col. 4, line 56) of maximum MAD ("MAD_o is the mean of the absolute

differences between pixels in the block in a reference frame for which noise is to be

reduced and the pixels in a block having the same position in another frame" at col. 4,

line 28) to minimum MAD ("The matching block is the one having the minimum value of

mean absolute difference, MAD, which is MAD_{min}" at col. 4, line 34),

the ratio greater than the threshold for determining the possibility of splitting the

macro block is the ratio of maximum MAD to minimum MAD ("If the ratio of MAD_o

/MAD_{min} is less than B, it is considered that the differences between the blocks are due

to noise" at col. 4, line 56; consequently, if the ratio is greater than B, the differences are

considerable enough to be further processed)

comparing the threshold value for determining the possibility of splitting the sub

block with the ratio of maximum MAD to minimum MAD (same process as above)

that the ratio greater than the threshold for determining the possibility of splitting

the sub block is the ratio of maximum MAD to minimum MAD (see above explanation).

It would have been obvious at the time the invention was made to one of ordinary

skill in the art for the threshold value of Mancini et al. to be compared using the ratio

taught by Boyce as described above, such that a block "caused by a poor motion

estimate such as due to a change in scene so that it is not included" (Boyce at column

2, line 49).

11.   Claims 5, 7, 17, 18, 20, 21, 23, 24, 31, 33, 43, 44, 46, 47, 49 and 50 are rejected

under 35 U.S.C. 103(a) as being unpatentable over the combination of Mancini et al.

and Keith et al. as applied to claims 2, 3 and 16 above, and further in view of Boyce.

Regarding **claims 5, 7, 31 and 33**, the Mancini et al. and Keith et al. combination

discloses an apparatus (an apparatus is inherent to carry out the function of the

method) and a method of splitting a block wherein the operation of setting a plurality of

splitting threshold values for a macro block in an image frame and determining whether

to split the macro block into sub blocks and wherein the operation of setting a plurality of

splitting threshold values for each sub block and determining whether to split each sub

block into smaller sub blocks comprises:

determining the possibility of splitting the macro block ("determine whether block

B_{ij} requires splitting", Mancini et al. at section 6.5.1, paragraph 3, line 6) by determining

whether the ratio of maximum mean absolute difference (MAD) to minimum MAD of a

sub block ("$\max(\kappa_i, i = 1,...,4)/\min(\kappa_i, I = 1,...,4) < \theta_3$" at section 6.5.1, paragraph 3, line

9; "ratio of the maximum to the minimum number of outliers in the four sub-blocks"

Mancini et al. at section 6.5.1, paragraph 3, line 13) in the macro block is greater than a

threshold value ("threshold value θ_3" Mancini et al. at section 6.5.1, paragraph 3, line

12) for determining the possibility of splitting the macro block; and

determining whether to split the macro block by comparing the threshold value

for determining the possibility of splitting the macro block ("Threshold θ_2" at section

6.5.1, paragraph 3, line 11), and comparing the ratio of maximum MAD to minimum

MAD, and a threshold value for determining whether to split the macro block with one

another ("max(κ_i, i = 1,...,4)/min(κ_i, I = 1,...,4) < θ_3" at section 6.5.1, paragraph 3, line 9;

"ratio of the maximum to the minimum number of outliers in the four sub-blocks" Mancini

et al. at section 6.5.1, paragraph 3, line 13), if a ratio is greater than the threshold value

for determining the possibility of splitting the macro block ("if Σ κ_i < θ_2 then do not split,

otherwise continue" Mancini et al. at section 6.5.1, paragraph 3, line 8; "tolerable

number of outliers as a fraction of the block size" Mancini et al. at section 6.5.1,

paragraph 3, line 11) in the operation of setting a plurality of splitting threshold values

("The steps above rely on three threshold values" Mancini et al. at section 6.5.1,

paragraph 3, line 10) for the macro block ("block B_{ij}" Mancini et al. at section 6.5.1,

paragraph 3, line 4) in the image frame and determining whether to split the macro

block into the sub blocks ("determine whether block B_{ij} requires splitting" Mancini et al.

at section 6.5.1, paragraph 3, line 6),

determining the possibility of splitting the sub block by determining whether the

ratio of maximum MAD to minimum MAD of the smaller sub block is greater than a

threshold value for determining the possibility of splitting the sub block (covered by

method above); and

determining whether to split the sub block by comparing the threshold value for

determining the possibility of splitting the sub block, and comparing the ratio of

maximum MAD to minimum MAD, and a threshold value for determining whether to split

the sub block with one another, if a ratio is greater than the threshold value for

determining the possibility of splitting the sub block in the operation of determining the

possibility of splitting the sub block by determining whether the ratio of maximum MAD

to minimum MAD of the smaller sub block is greater than the threshold value for determining the possibility of splitting the sub block (covered by method above).

The Mancini et al. and Keith combination does not teach comparing the threshold value for determining the possibility of splitting the macro block with the ratio of maximum MAD to minimum MAD, comparing the threshold value for determining the possibility of splitting the sub block with the ratio of maximum MAD to minimum MAD, and that the ratio greater than the threshold for determining the possibility of splitting the macro block and the ratio greater than the threshold for determining the possibility of splitting the micro block is the ratio of maximum MAD to minimum MAD.

Boyce discloses a method comprising

comparing the threshold value for determining the possibility of splitting the macro block ("determined value B" at col. 4, line 44) with the ratio ("ratio of MAD_o /MAD_{min}" at col. 4, line 56) of maximum MAD ("MAD_o is the mean of the absolute differences between pixels in the block in a reference frame for which noise is to be reduced and the pixels in a block having the same position in another frame" at col. 4, line 28) to minimum MAD ("The matching block is the one having the minimum value of mean absolute difference, MAD, which is MAD_{min}" at col. 4, line 34),

the ratio greater than the threshold for determining the possibility of splitting the macro block is the ratio of maximum MAD to minimum MAD ("If the ratio of MAD_o /MAD_{min} is less than B, it is considered that the differences between the blocks are due to noise" at col. 4, line 56; consequently, if the ratio is greater than B, the differences are considerable enough to be further processed)

comparing the threshold value for determining the possibility of splitting the sub

block with the ratio of maximum MAD to minimum MAD (same process as above)

that the ratio greater than the threshold for determining the possibility of splitting

the sub block is the ratio of maximum MAD to minimum MAD (see above explanation).

It would have been obvious at the time the invention was made to one of ordinary

skill in the art for the threshold value of the Mancini et al. and Keith et al. combination to

be compared using the ratio taught by Boyce as described above, such that a block

"caused by a poor motion estimate such as due to a change in scene so that it is not

included" (Boyce at column 2, line 49).

Regarding **claims 17, 18, 43 and 44**, the Mancini et al. and Keith et al.

combination discloses an apparatus (an apparatus is inherent to carry out the function

of the method) and a method wherein the operation of setting a plurality of macro block

splitting threshold values for splitting a macro block in an image frame into sub blocks

and determining whether to split the macro block according to whether a macro block at

the same location in a preceding image frame as the current macro block has been split

and wherein the operation of setting a plurality of macro block splitting threshold values

for splitting a macro block in an image frame into sub blocks and determining whether to

split the macro block according to whether a macro block at the same location in a

preceding image frame as the current macro block has been split comprises:

determining the possibility of splitting the macro block ("determine whether block

B_{ij} requires splitting" at section 6.5.1, paragraph 3, line 6) by determining whether the

ratio of maximum mean absolute difference (MAD) to minimum MAD of a sub block

("max(κ_i, i = 1,...,4)/min(κ_i, I = 1,...,4) < θ_3" at section 6.5.1, paragraph 3, line 9; "ratio of

the maximum to the minimum number of outliers in the four sub-blocks" at section 6.5.1,

paragraph 3, line 13) in the macro block is greater than a threshold value ("threshold

value θ_3" at section 6.5.1, paragraph 3, line 12) for determining the possibility of splitting

the macro block,

determining whether the ratio of maximum of maximum MAD to minimum MAD is

less than the threshold value for determining whether to split the macro block ("max(κ_i, i

= 1,...,4)/min(κ_i, I = 1,...,4) < θ_3" at section 6.5.1, paragraph 3, line 9; "ratio of the

maximum to the minimum number of outliers in the four sub-blocks" at section 6.5.1,

paragraph 3, line 13),

determining whether the preceding macro block has been split ("region of a

previous frame may be found that corresponds fairly well to a region being coded in a

current frame" Keith et al. at col. 25, line 55) if the ratio is less than the threshold value

for determining whether to split the macro block ("max(κ_i, i = 1,...,4)/min(κ_i, I = 1,...,4) <

θ_3" Mancini et al. at section 6.5.1, paragraph 3, line 9),

determining not to split the macro block if the preceding macro block has not

been split and determining to split the macro block if the preceding macro block has

been split ("If the comparison indicates that this best choice for a translated region does

not provide an acceptable match to the target region, the target region is checked for

minimum size (3924). If the target region is larger than the minimum size, it is split",

Keith et al. at col. 27, line 16),

determining the possibility of splitting the sub block by determining whether the ratio of maximum mean absolute difference (MAD) to minimum MAD of the smaller sub block is greater than a threshold value for determining the possibility of splitting the sub block (covered by method above)

determining whether the ratio of maximum of maximum MAD to minimum MAD is less than the threshold value for determining whether to split the sub block (covered by method above),

determining whether the preceding sub block has been split if the ratio is less than the threshold value for determining whether to split the sub block (covered by method above); and

determining not to split the sub block if the preceding sub block has not been split and determining to split the sub block if the preceding sub block has been split (covered by method above).

The Mancini et al. and Keith et al. combination does not teach a method

determining whether the ratio of maximum MAD to minimum MAD is between the threshold value for determining the possibility of splitting the macro block and a threshold value for determining whether to split the macro block;

determining whether the preceding macro block has been split if the ratio is between the two threshold values in the operation of determining whether the ratio of maximum MAD to minimum MAD is between the threshold value for determining the possibility of splitting the macro block and the threshold value for determining whether to split the macro block

determining whether the ratio of maximum MAD to minimum MAD is between the threshold value for determining the possibility of splitting the sub block and a threshold value for determining whether to split the sub block;

determining whether the preceding sub block has been split if the ratio is between the two threshold values in the operation of determining whether the ratio of maximum MAD to minimum MAD is between the threshold value for determining the possibility of splitting the sub block and the threshold value for determining whether to split the sub block.

However, by determining whether the ratio is greater than the threshold value for determining the possibility of splitting the macro block (and subsequently the threshold value for determining the possibility of splitting the sub block), prior to determining whether the ratio of maximum of maximum MAD to minimum MAD is less than the threshold value for determining whether to split the macro block (and subsequently for the sub block), one would thereby determine whether the ratio is in between the two thresholds. If so, then determination of whether the preceding macro block (and subsequently sub block) has been split can occur.

Boyce discloses a method comprising determining whether the ratio of maximum MAD to minimum MAD ("ratio of MAD_o /MAD_{min}" at col. 4, line 56) is greater than the threshold value ("determined value B" at col. 4, line 44) for determining the possibility of splitting the macro block ("If the ratio of MAD_o /MAD_{min} is less than B, it is considered that the differences between the blocks are due to noise" at col. 4, line 56;

consequently, if the ratio is greater than B, the differences are considerable enough to

be further processed) and

determining whether the ratio of maximum MAD to minimum MAD is greater than

the threshold value for determining the possibility of splitting the sub block (same

method as above).

It would have been obvious at the time the invention was made to one of ordinary

skill in the art for the threshold value of the Mancini et al. and Keith et al. combination to

be compared using the ratio taught by Boyce as described above, such that a block

"caused by a poor motion estimate such as due to a change in scene so that it is not

included" (Boyce at column 2, line 49).

Regarding **claims 20, 21, 46 and 47**, Mancini et al. discloses an apparatus (an

apparatus is inherent to carry out the function of the method) and a method wherein the

image frame is a binocular image frame representing a three dimensional image as

described in the 102 rejection of claim 10 above.

Regarding **claims 23, 24, 49 and 50**, Mancini et al. discloses an apparatus (an

apparatus is inherent to carry out the function of the method) and a method wherein the

operation of splitting is performed using quadtree disparity estimation as described in

the 102 rejection of claim 13 above.

12.   Claims 8, 9, 34 and 35 are rejected under 35 U.S.C. 103(a) as being

unpatentable over the combination of Mancini et al. and Boyce as applied to claims 4

and 6 above, and further in view of Keith et al.

The Mancini et al. and Boyce combination discloses an apparatus (an apparatus is inherent to carry out the function of the method) and a method wherein the operation of determining whether to split the macro block by comparing the threshold value for determining the possibility of splitting the macro block, the ratio of maximum MAD to minimum MAD, and a threshold value for determining whether to split the macro block with one another, if the ratio of maximum MAD to minimum MAD is greater than the threshold value for determining the possibility of splitting the macro block in the operation of determining the possibility of splitting the macro block by determining whether the ratio of maximum MAD to minimum MAD of the macro block is greater than a threshold value for determining the possibility of splitting the macro block comprises:

determining whether the ratio of maximum MAD to minimum MAD is between the threshold value for determining the possibility of splitting the macro block and the threshold value for determining whether to split the macro block;

determining to split the macro block if the ratio is between the two threshold values in the operation of determining whether the ratio of maximum MAD to minimum MAD is between the threshold value for determining the possibility of splitting the macro block and the threshold value for determining whether to split the macro block ("otherwise split block B_{ij}" at section 6.5.1., paragraph 3, line 9)

determining whether the ratio of maximum MAD to minimum MAD is between the threshold value for determining the possibility of splitting the sub block and the threshold value for determining whether to split the sub block;

determining to split the sub block if the ratio is between the two threshold values in the operation of determining whether the ratio of maximum MAD to minimum MAD is between the threshold value for determining the possibility of splitting the sub block and the threshold value for determining whether to split the sub block (same method as above).

The Mancini et al. and Boyce combination does not teach a method

determining whether the preceding macro block has been split just before determining to split the macro block; and

determining not to split the macro block if the preceding macro block has not been split, and determining to split the macro block if the preceding macro block has been split

determining whether the preceding sub block has been split just before determining to split the sub block; and

determining not to split the sub block if the preceding sub block has not been split, and determining to split the sub block if the preceding sub block has been split.

Keith et al. discloses a system comprising the steps of determining whether the preceding macro block has been split ("If the comparison indicates that this best choice for a translated region does not provide an acceptable match to the target region, the target region is checked for minimum size (3924). If the target region is larger than the minimum size, it is split" at col. 27, line 16) just before determining to split the macro block (figure 39, numeral 3926),

determining not to split the macro block if the preceding macro block has not

been split (figure 39, numeral 3928), and determining to split the macro block if the

preceding macro block has been split (figure 39, numeral 3926)

determining whether the preceding sub block has been split just before

determining to split the sub block (same method as above); and

determining not to split the sub block if the preceding sub block has not been

split, and determining to split the sub block if the preceding sub block has been split

(same method as above).

It would have been obvious at the time the invention was made to one of ordinary

skill in the art for the split condition of the Mancini et al. and Boyce combination to be

determined using the inter-frame coding taught by Keith et al. as described above, for

"one need only code the differences rather than the absolute values" (Keith et al. at

column 25, line 57).

13.   Claims 30-35, 43, 44, 46, 47, 49 and 50 are rejected under 35 U.S.C. 103(a) as

being unpatentable over the combination of Mancini et al., Keith and Boyce as applied

to claims 4, 6, 17 and 18 above, and further in view of Sethuraman.

Mancini et al. teach the methods carried out by the apparatus as described in the

103 rejections of claims 4, 6, 17 and 18 above.

Mancini et al. does not explicitly disclose an apparatus to carry out the methods.

Sethuraman et al. discloses a system comprising

a macro block splitting possibility determining portion ("Estimate block disparity"

in figure 3, third block)

a macro block splitting portion ("Divide a block into 4", figure 3, third block)

a sub block splitting possibility determining portion ("Estimate block disparity" in

figure 3, third block after "Set the blocks from the previous level as the root nodes",

figure 3, fourth block)

a sub block splitting portion ("Divide a block into 4", figure 3)

a preceding macro block splitting determiner ("Else, go to the next higher

resolution level" in figure 3, fourth block)

a macro block splitting final determiner ("Stopping condition for recursion" in

figure 3, third block)

a preceding sub block splitting determiner ("Else, go to the next higher resolution

level" in figure 3, fourth block)

a sub block splitting final determiner ("Stopping condition for recursion" in figure

3, third block).

It would have been obvious at the time the invention was made to one of ordinary

skill in the art to execute the methods of the Mancini et al., Keith and Boyce combination

using the system taught by Sethuraman et al. as described above, to enable the
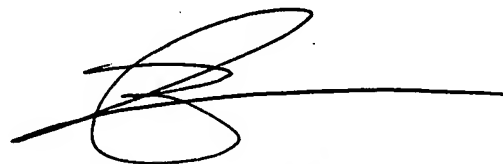
methods to be performed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katrina Fujita whose telephone number is (571) 270-1574. The examiner can normally be reached on M-Th 8-5:30pm, F 8-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian P. Werner can be reached on (571) 272-7401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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